

Warren Millet
595 Bryceland Boulevard
Ridgeland, Mississippi
39157
Telephone 601-956-5657

SPECIFICATION:

The invention was constructed out of strong material to withstand any normal wear and tear in the use of the invention.

The electronic parts were purchased and then addressed in a manner to create the invention to make it function.

The lighting design and schematic are wired in such a manner as to "flash the lights" emulating the same time it takes for the bottle cap to reach the end of the bottle cap tunnel (Several light patterns).

There are several different lighting patterns that are introduced to make the invention more interesting.

As follows:

There is push button switch in which the user can change the mode of the lighting pattern.

The first being a standard pattern following the exact time each obstacle rib is struck by the bottle cap, that particular light will flash and then go off. The last light flashes when the bottle cap strikes the last obstacle rib then that light goes off. So, the lights emulate the same pattern as the bottle cap.

A second being that the lighting pattern starts at the top and flashes two rows at a time emulating the same pattern as the bottle cap.

I have created other lighting patterns as follows:

A third pattern being that the first and last lights positioned on the bottle cap tunnel start flashing in opposite directions meeting in the middle then traveling to the top and bottom of the bottle cap tunnel. The lights then go off when they reach the original starting point.

Other lighting patterns have been addressed into the invention. In, review, I think entering any more lighting patterns for explanation is fruitless because in my opinion, the reader gets the idea that many different lighting patterns can be introduced into the invention without mentioning all of them.

SPECIFICATION: PAGE 2

The lighting patterns can be programmed to do any pattern one wishes. The number of lighting patterns is so many that it is senseless to try to mention them all.

I have measured many bottle caps from different distributors and all of them are the same.

This is probably do with the size of the top of the bottle fitting the mouth of a person consuming the product.

So, the inside obstacle ribs of the bottle cap tunnel are a tiny bit further way from each other than the diameter of the bottle cap. Thus, creating a very small space between the bottle cap and the obstacle ribs that the bottle cap has to pass by.

The fact that there is a very small space between the bottle cap and the obstacle ribs, the bottle cap is forced to strike each obstacle rib on the way down the bottle cap tunnel. This symmetrical design causes the bottle cap to spiral and ricochet back and forth as the bottle cap travels down the bottle cap tunnel.

Warren Millet
595 Bryceland Boulevard
Ridgeland, Mississippi
39157
Telephone: 601-956-5657

TITLE OF THE INVENTION:

The invention is as follows:

The invention is a sensor lighted bottle cap tunnel.

This application claims priority of application serial number 10/279497 filing date of
10/24/2002.

Warren Millet
595 Bryceland Boulevard
Ridgeland, Mississippi
39157
Telephone: 601-956-5657

CROSS REFERENCE:

My other invention's application number is 10/279497 applied for 10/24/02.

The new invention has some changes to the first application for the utility patent.

1) The first had sound activated lighting only which limited the lighting display.

The new additional lighting now has the option to use activated lights that are not sound activated. The new lighting also allows the lighting to be activated by different types of sensors. Thus, allowing a much broader margin for different lighting displays to be addressed to the invention.

2) The second part of the added changes is that the new invention has a new concept for the bottle cap tunnel's construction. The first invention had a free standing obstacle bar that slid in and out of the bottle cap tunnel's frame. The new bottle cap tunnel has obstacle ribs that are actually a part of the inside walls of the frame. The measurements for the obstacle ribs are the same as the obstacle bars(first invention) and also have the same positioning in both designs. The reason for the obstacle ribs is to make the invention easy to manufacture. Both the obstacle bars (first invention) and the obstacle ribs (second invention) create the same spiral and ricochet of the bottle cap as the bottle cap travels down the bottle cap tunnel.

3) The third part of the added changes is that the new invention's frame is different in the following aspect: The first invention had a bottom to the bottle cap tunnel. The second invention has no bottom to the bottle cap tunnel. Thus, allowing the bottle cap to travel down the bottle cap tunnel into a trash box. The trash box can then be dumped into any garbage can. This allows the consumer to enjoy the full benefit of watching the bottle cap travel the same distance every time. The reason is the bottle cap tunnel never gets filled up with bottle caps because it has no bottom.

I am cross referencing this information as stated. I am seeking patent protection on both applications.

Warren Millet
595 Bryceland Boulevard
Ridgeland, Mississippi 39157
Phone 601-956-5657

BACKGROUND OF THE INVENTION:

My invention started out around the beginning of July 2002. I have a patent applied for with the original invention with the United States Patent and Trademark office. (# 10/279497)

I have made some changes to the original invention. The bottle cap tunnel that had a free standing obstacle bar no longer exists in the second generation model. This particular invention has obstacle ribs that are part of the inside walls of the tunnel. The obstacle ribs were thought of to replace the obstacle bar to make the invention easier to mass produce. This thought came to me around the beginning of January of 2003.

Also the original invention used sound activated lighting which also has some new changes.

This part of the invention came to me around March of 2003. As follows:

I now use sensor lighting that is activated by an infrared light emitting diode.

I also thought of using a microchip that could be programmed to create the lighting design.

This microchip took some time to program to do the function in which I intended.

A Compact Disk with the explanation are part of the invention that were thought of in theory.

After proving the theory that the unit did function in the manner that I intended it to,

is when I decided to apply for my continuation of the original patent application.

The schematic and explanation included in the package explains how the invention works.

The mechanical specifications are the same as the original invention. As follows:

Basically , the theory of the bottle cap tunnel is the same as the original unit that I constructed.

It works the same as the original model only the second generation will be much easier to mass produce with the obstacle ribs replacing the free standing obstacle bar.

The application of the lighting design is a new idea introduced to the original invention. As follows:

The lighting design that I use in the second generation model is much more appealing and also uses off the shelf parts. But , the thought of how to make the electronic parts function used in my invention came to me around March of the year 2003. I addressed the way that all of these electronic parts function in the manner intended for this invention.

Warren Millet
595 Bryceland Boulevard
Ridgeland, Mississippi
39157
Telephone 601-956-5657

BRIEF SUMMARY OF THE INVENTION:

The bottle cap tunnel mounts wherever easily.

The bottle cap tunnel forces the bottle cap to go into a trash box that holds many bottle caps.

The bottle cap tunnel has novelty in that it creates a fun atmosphere when activated by a bottle cap.

The invention has been tested over and over again and the invention always works.

Any one who chooses to utilize the invention has fun watching the bottle cap descend down the bottle cap tunnel with the lights flashing at the same time the bottle cap strikes each obstacle rib.

Warren Millet
595 Bryceland Boulevard
Ridgeland, Mississippi
39157
Telephone 601-956-5657

BRIEF DESCRIPTION OF THE DRAWINGS:

The invention is a bottle cap tunnel that has obstacle ribs positioned on the four inside walls of the bottle cap tunnel. The obstacle ribs are positioned symmetrically to force the bottle cap to spiral and ricochet down the bottle cap tunnel.

The bottle cap tunnel has a circuit board behind the back wall that has electronic components positioned with a sensor positioned at the top of the bottle cap tunnel. The sensor is activated by the bottle cap breaking the beam of an infrared beam. That sensor then sends a signal to a micro controller. The micro controller then sends a signal to lights that are activated to flash. The flash of the lights emulates the same time the bottle cap takes to travel down the bottle cap tunnel. The obstacle ribs of the back wall of the bottle cap tunnel have lights on the side of each obstacle rib. As the bottle cap descends down the bottle cap tunnel the lights flash at the same speed. The bottle cap tunnel has no bottom. The bottle cap is forced to go into a trash box. Several light patterns have been addressed to the invention through the micro-controller. The first being the standard: As the bottle cap travels down the bottle cap tunnel the lights flash at each obstacle rib (positioned on each side of each obstacle rib). Each obstacle rib set of lights go on then off in the same time it takes the bottle cap to travel past that particular obstacle rib. (The time is approximately is .117 seconds / one tenth and seventeen hundred seconds).

The front and sides of the bottle cap tunnel have strong clear material that allows the bottle cap to be visible as the bottle cap travels down the bottle cap tunnel.

The bottle cap tunnel (funnel part) has a hole where it mounts to any wall or secure surface with a screw. The bottle cap tunnel is thirty three inches in height. The bottle cap tunnel is two and one-quarter inches in width and depth.

Warren Millet
595 Bryceland Boulevard
Ridgeland, Mississippi
39157
Telephone 601-956-5657

DETAILED DESCRIPTION OF THE DRAWINGS OF THE BOTTLE CAP TUNNEL:

The top part(funnel part) measures three inches in height The funnel part measures three and one/ half inches in depth. The (funnel part) measures five inches in width.

Where the bottle cap tunnel(neck of bottle cap tunnel) meets the funnel part the bottle cap tunnel is thirty inches in height. The bottle cap tunnel is two and one half inches in width and depth.

The bottle cap tunnel has no bottom. The bottle cap is forced to go into a trash box.

The measurements are described on pages of drawings.

1) The front side of the inside wall of the bottle cap tunnel has one eight inch obstacle ribs starting at the very top of the bottle cap tunnel(where neck starts). These obstacle ribs are positioned center to center down the bottle cap tunnel's front inside wall every one and one/half inches. This positioning continues all the way down the front inside wall. The count on the front obstacle ribs is twenty one.

2) The back side of the inside wall of the bottle cap tunnel has one eight inch obstacle ribs starting one half inch down from the top of the bottle cap tunnel(where neck starts). These obstacle ribs are positioned center to center down the bottle cap tunnel's back inside wall one and one/half inches.

The count on the back obstacle ribs is twenty.

3) The inside wall of both side walls of the bottle cap tunnel both have one eight inch obstacle ribs. The side wall obstacle ribs are positioned center to center down the bottle cap tunnel center to center every one inch. The first obstacle rib of the inside of the side walls are positioned one quarter inch down from the top of the bottle cap tunnel(where neck starts). Both side inside walls of the bottle cap tunnel are a mirror image of each other.

The count on the side obstacle ribs is thirty one.

Warren Millet
595 Bryceland Boulevard
Ridgeland, Mississippi
39157
Telephone 601-956-5657

DETAILED DESCRIPTION OF THE SPACING BETWEEN OBSTACLE RIBS

THE EXPLANATION OF THE DRAWINGS ARE ON DRAWING PAGES

- 1) The inside wall measurement from the front inside wall to the back inside wall is one and seven/sixteenth inches. Thus, both inside front and back walls have obstacle ribs that are positioned to force the bottle cap to ricochet. So, the measurement from the front inside wall obstacle rib to the back inside wall obstacle rib is one and three/sixteenths inches.
- 2) The inside wall measurement from the inside wall of the side wall to the other inside wall of the side wall is one and seven/sixteenths inches. Thus, both inside side walls have one /eight inch obstacle ribs that are positioned to force the bottle cap to spiral. So, the measurement from the side obstacle rib to the other side obstacle rib is one and three/sixteenth inches.

NOTE: THE ABOVE MEASUREMENTS CREATE AND OPEN AREA OF ONE AND THREE SIXTEENTHS INCHES. ALL STANDARD BOTTLE CAPS ARE ONE AND ONE EIGHT INCHES IN DIAMETER. THIS OPEN AREA CREATED BY THE MEASUREMENTS FROM ALL FOUR SIDES OF THE OBSTACLE RIBS CREATES A VERY TINY SPACE FOR THE BOTTLE CAP TO PASS BY. THIS TINY SPACE FORCES THE BOTTLE CAP TO STRIKE EACH OBSTACLE RIB AS IT TRAVELS DOWN THE BOTTLE CAP TUNNEL.

Warren Millet
595 Bryceland Boulevard
Ridgeland, Mississippi
39157
Telephone 601-956-5657

DESCRIPTION OF HOW THE ELECTRONICS FUNCTION IN RELATIONSHIP TO THE BOTTLE CAP TUNNEL

The light display is an array of lights arranged in twenty rows corresponding to the twenty back wall obstacle ribs of the bottle cap tunnel. The lights flash on and off in sequence starting at the top of the bottle cap tunnel tracking the bottle cap as it falls through the tunnel. A micro controller (MCU) controls the lighting sequence and timing. A sensor is positioned just above the first back obstacle rib. This sensor triggers the start of the lighting display sequence. The bottle cap falls through an infrared beam causing the receiving sensor to send a trigger pulse to the micro controller telling the micro controller to start the lighting sequence. The lighting sequence takes about two and four tenths seconds to complete. Upon completion with no bottle caps in the bottle cap tunnel, a finale display is initiated lasting about one second. A mode switch positioned on the bottle cap tunnel allows the user to change the lighting display sequence.

- 1) The first style is the standard lighting display. The lighting display travels at the same speed down the bottle cap tunnel. The last light goes off when the bottle cap reaches the end then into a trash box.
- 2) The second being two rows at a time to create the same pattern as the first style lighting display.
- 3) The third being that the first and last start going opposite directions meeting in the middle and then going on to the very top and bottom of the bottle cap tunnel. The lights go off when they reach their original starting point.
- 4) The fourth being that the first goes off, then the third, back to the second, then to the fourth obstacle rib. The pattern goes on until the bottle cap reaches the bottom then the last lights go off.
- 5) There are other lighting patterns but I feel it is insignificant to mention them all.

NOTE: THE INVENTION COULD BE DONE WITH VARIOUS MEASUREMENTS ON THE BOTTLE CAP TUNNEL AND ALSO USING A DIFFERENT ELECTRONIC DESIGN. I INVENTED THE BOTTLE CAP TUNNEL UNIT USING THESE PARTICULAR MEASUREMENTS AND ELECTRONIC DESIGN TO MAKE THE UNIT EASY TO MANUFACTURE.

WARREN MILLET
595 BRYCELAND BOULEVARD
RIDGELAND, MISSISSIPPI
39157
TELEPHONE 601-956-5657

Light Display Electronics

Circuit Description

The light display consists of twenty rows of LEDs (Light Emitting Diodes) placed so as to align with the twenty deflection ribs on the backside of the bottle cap tunnel. The lights turn on and off in a prescribed pattern that is synchronized to the position of the bottle cap as it falls through the tunnel. Five different light sequence patterns are selectable from a push button switch. The light pattern sequence begins when the bottle cap enters the top of the tunnel and upon exiting the bottom of the tunnel, a final short display pattern sequence is initiated.

The bottle cap entry into the top of the tunnel is sensed by a phototransistor and infrared LED (Q1 and D1 in the schematic diagram). The bottle cap momentarily interrupts the infrared light path causing the phototransistor Q1 to send a short pulse to the microcontroller chip. The microcontroller performs the complete control of the light pattern sequences and acts as the central "brain" of the light display system. A program in the microcontroller monitors the sensor input from Q1 and initiates and controls the light pattern sequence when a sensor signal is present. Twenty microcontroller output pins drive the twenty LED rows, supplying source current to the LEDs causing them to light. The accurate timing of the lighting sequence is achieved by an internal (to the microcontroller) clock generator using an external 3.579545 MHz quartz crystal, X1, as the resonator for the clock oscillator.

The microcontroller, phototransistor, and all LEDs operate from a 5 V (Volt) regulated power source provided by a 5 V regulator IC (Integrated Circuit). The Light display system requires an unregulated 9 V DC power source. Any commercially available 110 V AC to 9 V DC adapter capable of supplying 1 A (Ampere) of current is adequate for this purpose.

Other Implementations of the Light Display

The light display system can be implemented with various choices of components to accomplish the same effects. The photo-sensor may be replaced with any suitable proximity detector for the purpose of detecting the bottle cap. Incandescent light sources or fluorescent light displays could be substituted for the LEDs with the use of an appropriate driver IC. The microcontroller IC could be replaced with a custom ASIC (Application Specific Integrated Circuit) or with multiple SSI (Small-Scale Integration) ICs to implement the required controlling functions.

**WARREN MILLET
595 BRYCELAND BOULEVARD
RIDGELAND, MISSISSIPPI
39157
TELEPHONE 601-956-5657**

SOURCE CODE DESCRIPTION

```

list p="16f72",f=inhx32
#include <p16f72.inc>

__CONFIG H'3fa9'

INT_VEC    equ    04h
INT_MASK   equ    61h

Flags      equ    20h
portAreg   equ    21h
portBreg   equ    22h
portCreg   equ    24h
counter_l  equ    26h
counter_h  equ    28h
count_m    equ    29h
mode_flag  equ    2ah
ptr        equ    0x2b
idle_ctr   equ    02ch
idle_ctr_hi equ    0x2d

org 00h
goto Start

org INT_VEC
goto INT_RTN

;-----Display pattern data-----;
org 09h
doogie
data 001h, 00h, 40h ;1
data 02h, 00h, 20h ;2
data 04h, 00h, 010h ;3
data 08h, 00h, 08h ;4
data 020h, 00h, 04h ;5
data 00h, 01h, 02h ;6
data 00h, 02h, 01h ;7
data 00h, 84h, 00h ;8
data 00h, 48h, 00h ;9
data 00h, 30h, 00h ;10
data 00h, 30h, 00h ;11
data 00h, 48h, 00h ;12
data 00h, 84h, 00h ;13
data 00h, 02h, 01h ;14
data 00h, 01h, 02h ;15
data 020h, 00h, 04h ;16
data 08h, 00h, 08h ;17
data 04h, 00h, 010h ;18
data 02h, 00h, 20h ;19
data 001h, 00h, 40h ;20
data 00h, 00h, 00h ;Clear

```

mod3

```

data 01h, 00h, 40h ;1
data 03h, 00h, 60h ;2
data 07h, 00h, 70h; ;3
data 0fh, 00h, 78h ;4
data 2fh, 00h, 7ch ;5
data 2fh, 01h, 7eh ;6
data 2fh, 03h, 7fh ;7
data 2fh, 87h, 7fh ;8
data 2fh, 0dfh, 7fh ;9
data 2fh, 0ffh, 7fh ;10
data 2fh, 0efh, 7fh ;11
data 2fh, 0c7h, 7fh ;12
data 2fh, 83h, 7fh ;13
data 2fh, 01h, 7eh ;14
data 2fh, 00h, 7ch ;15
data 0fh, 00h, 78h ;16
data 07h, 00h, 70h ;17
data 03h, 00h, 60h ;18
data 01h, 00h, 40h ;19
data 00h, 00h, 00h ;20
data 00h, 00h, 00h ;21 Clear

```

mod4

```

data 01h, 00h, 00h ;1 1
data 04h, 00h, 00h ;2 3
data 02h, 00h, 00h ;3 2
data 08h, 00h, 00h ;4 4
data 00h, 01h, 00h ;5 6
data 20h, 00h, 00h ;6 5
data 00h, 02h, 00h ;7 7
data 00h, 08h, 00h ;8 9
data 00h, 04h, 00h ;9 8
data 00h, 10h, 00h ;10 10
data 00h, 40h, 00h ;11 12
data 00h, 20h, 00h ;12 11
data 00h, 80h, 00h ;13 13
data 00h, 00h, 02h ;14 15
data 00h, 00h, 01h ;15 14
data 00h, 00h, 04h ;16 16
data 00h, 00h, 10h ;17 18
data 00h, 00h, 08h ;18 17
data 00h, 00h, 20h ;19 19
data 00h, 00h, 40h ;20 21
data 00h, 00h, 00h ;21 Clear

```

Start

```

Banksel    PORTA
clrf      Flags
clrf      portAreg
clrf      portBreg

```

```

    clrf    portCreg
    clrf    mode_flag
    clrf    ptr
    clrf    idle_ctr
    movlw   10h
    banksel TRISA
    movwf   TRISA           ;Set RA4 as input

    clrf    TRISB           ;Set Port B for all outputs
    banksel TRISC
    clrf    TRISC           ;Config Port C for ouputs [6:0]
    bsf     TRISC,7         ;Port C pin 7 as input
    banksel ADCON1         ;All digital (not using ADC)
    movlw   06h
    movwf   ADCON1
    banksel PORTA
    clrf    PORTA
    clrf    PORTB
    banksel PORTC
    clrf    PORTC

Initialize
    movlw   30h
    banksel T1CON
    movwf   T1CON
    bcf     T1CON,TMR1ON    ;Turn off Timer 1
    banksel PIR1
    clrf    PIR1           ;clear the Timer1 overflow interupt flag
    movlw   0aah
    movwf   TMR1H
    clrf    TMR1L           ;delay the interupt
    clrf    INTCON
    banksel PIE1
    clrf    PIE1
    bsf     PIE1,TMR1IE     ;enable the Timer1 interupt
    banksel INTCON
    bsf     INTCON,PEIE
    bsf     INTCON,GIE

    bsf     T1CON,TMR1ON
    bcf     STATUS,C

Sense_loop
    btfsc   PORTA, 4        ;Sensor trigger
    goto    next
    bsf     Flags,0
    call    delay

next
    btfss   PORTC,7         ;mode switch pressed?
    call    mode
    btfsc   Flags,1         ;cap in tunnel
    clrf    idle_ctr

```

```

        btfsc  Flags,2                ;tunnel clear of all caps?
        call   finale                 ;start the finale
        goto   Sense_loop

skip_RA4
        bsf     portAreg,5
        bcf     portAreg,4
        return

ra4_rt
        bsf     portAreg,3
        bcf     portAreg,4
        return

INT_RTN
        banksel  INTCON
        bcf      INTCON, GIE          ;Disable interrupts
        banksel  PIR1
        bcf      PIR1,TMR1IF
        banksel  TMR1H
        movlw    00cch
        movwf    TMR1H
        movlw    0e0h
        movwf    TMR1L
        banksel  PORTA
        incf     idle_ctr,1           ;increment the idle counter
        btfsc    STATUS,Z             ;overflow to hi byte
        incf     idle_ctr_hi,1
        movf     idle_ctr_hi,0
        sublw    07h
        btfss    STATUS,Z
        goto     norm_int
        movf     idle_ctr,0
        sublw    02h
        btfss    STATUS,Z
        goto     norm_int
        call     finale
        retfie

norm_int
        btfsc    Flags,0              ;Bottle cap crossing sensor
        bsf      Flags,1              ;Bottle cap in tunnel
        btfsc    Flags,4              ;Mode 3
        goto     in_tube
        btfsc    Flags,5
        goto     in_tube
        btfsc    Flags,6
        goto     in_tube
        goto     simple

in_tube
        btfss    Flags,1
        retfie

```



```

        btfsc  Flags,4
        goto   m3
        btfsc  Flags,5
        goto   m4
        btfsc  Flags,6
        goto   m5
simple
        call   shift_left
        btfss  Flags,1
        retfie
        goto   tunnel_clear

m3
        btfsc  Flags,0
        clrf   ptr
        movlw  doogie
        call   disp_stepPat
        bcf    Flags,0
        goto   tunnel_clear

m4
        btfsc  Flags,0
        clrf   ptr
        movlw  mod3
        call   disp_stepPat
        bcf    Flags,0
        goto   tunnel_clear

m5
        btfsc  Flags,0
        clrf   ptr
        movlw  mod4
        call   disp_stepPat
        bcf    Flags,0
tunnel_clear
        clrw
        iorwf  portAreg,0
        iorwf  portBreg,0
        iorwf  portCreg,0
        btfsc  STATUS,2
        bsf    Flags,2
        retfie
                                ;Start finale if tunnel is clear of all caps
                                ;Check for all zeros in all port registers
                                ;return if not all zeros (sequence not finished)
                                ;Finale flag

get_tableByte
        banksel PMCON1
        bsf    PMCON1,RD
        nop
        nop
        banksel PMDATL
        movf   PMDATL,W
        return

disp_stepPat

```

```

addwf ptr,0
banksel    PMADRL
movwf PMADRL
clrw
movwf PMADRH
banksel    PORTA
movf ptr,W    ;advance ptr to next line
addlw 03h
movwf ptr
clrw
call get_tableByte
banksel    PORTA
movwf portAreg
banksel    PMADRL
movf PMADRL,W
addlw 01h
movwf PMADRL
call get_tableByte
banksel    PORTA
movwf portBreg
banksel    PMADRL
movf PMADRL,W
addlw 01h
movwf PMADRL
call get_tableByte
banksel    PORTA
movwf portCreg
call write_port
return

```

```

mode
banksel    INTCON
bcf INTCON, GIE    ;Disable interrupts
banksel    PORTA
incf mode_flag    ;advance to next display mode
movf mode_flag,0
xorlw 05h    ;back to first mode?
btfsc STATUS,Z
movwf mode_flag    ;reset to mode 0
movf mode_flag,0
sublw 01h
btfsc STATUS,Z
bsf Flags,3
movf mode_flag,0
sublw 02h
btfsc STATUS,Z
goto mode2
movf mode_flag,0
sublw 03h
btfsc STATUS,Z
goto mode3

```

```

        movf    mode_flag,0
        sublw   04h
        btfsc   STATUS,Z
        goto    mode4

simple_modes
        bcf     Flags,6
        movlw   .22
        movwf   count_m
        bsf     Flags,0
loop2:
        call    shift_left
        call    sdelay
        decfsz  count_m,f
        goto    loop2
        clrf    idle_ctr
        clrf    idle_ctr_hi
        retfie

mode2:
        bsf     Flags,4           ;mode 2 flag
        bcf     Flags,3
        movlw   .21
        movwf   count_m
loop9:
        movlw   doogie
        call    disp_stepPat
        call    sdelay
        decfsz  count_m,f
        goto    loop9
        clrf    ptr
        clrf    idle_ctr
        clrf    idle_ctr_hi
        retfie

mode3:
        bsf     Flags,5           ;mode 3 flag
        bcf     Flags,4           ;clear mode 2 flag
        movlw   .21
        movwf   count_m
loop10:
        movlw   mod3
        call    disp_stepPat
        call    sdelay
        decfsz  count_m,f
        goto    loop10
        clrf    ptr
        clrf    idle_ctr
        clrf    idle_ctr_hi
        retfie

```

```

mode4
    bsf    Flags,6           ;mode 3 flag
    bcf    Flags,5           ;clear mode 2 flag
    movlw  .21
    movwf  count_m
loop11
    movlw  mod4
    call   disp_stepPat
    call   sdelay
    decfsz count_m,f
    goto   loop11
    clrf   ptr
    clrf   idle_ctr
    clrf   idle_ctr_hi
    retfie

shift_left
    banksel    PORTA
    movf    PORTA,0
    bcf      STATUS,C
    rlf      portAreg,1           ;rotate left Flag register
    btfsc    Flags,0
    bsf      portAreg,0

    btfss    Flags,0
    goto     skipit
    btfsc    Flags,3
    bsf      portAreg,1

skipit
    bcf      Flags,0
    bcf      STATUS,C
    rlf      portBreg,1
    rlf      portCreg,1
    btfsc    portCreg,7
    bcf      portCreg,7
    btfsc    portAreg,6
    bsf      portBreg,0
    bcf      portAreg,6
    btfsc    portAreg,4
    call     skip_RA4
    call     write_port
    return

shift_right
    banksel    PORTA
    movf    PORTA,0
    bcf      STATUS,C
    rrf      portCreg,1
    rrf      portBreg,1
    btfsc    STATUS,C

```

```

bsf    portAreg,6
bcf    STATUS,C
rrf    portAreg,1
btfsc  portAreg,4
call   ra4_rt
bsf    portCreg,6
call   write_port
return

```

write_port

```

movf   portAreg,w
movwf  PORTA           ;update ports
movf   portBreg,w
movwf  PORTB
movf   portCreg,w
movwf  PORTC
return

```

finale

```

banksel    INTCON
bcf        INTCON, GIE    ;Disable interrupts

```

```

movlw .21
movwf count_m

```

loop3

```

call   shift_right
call   fdelay
decfsz count_m,f
goto   loop3
banksel    PORTA
movf  PORTA,0
clrf  portAreg
clrf  portBreg
clrf  portCreg
call  write_port
movwf PORTC
call  sdelay
movf  PORTA,0
movlw 0ffh
movwf PORTA           ;update ports
movwf PORTB
movwf PORTC
call  sdelay
movf  PORTA,0
clrw
movwf PORTA           ;update ports
movwf PORTB
movwf PORTC
bcf   Flags,0

```

```

    bcf    Flags,1
    bcf    Flags,2
    clrf   ptr
    clrf   idle_ctr
    clrf   idle_ctr_hi
    retfie

```

```

delay
    movlw 047h
    movwf counter_h
Inner
    movlw 0bfh
    movwf counter_l
Dloop2
    nop
    nop
    nop
    decfsz counter_l,f
    goto   Dloop2
    decfsz counter_h,f
    goto   Inner
    nop
    return

```

```

fdelay
    movlw 027h
    movwf counter_h
Inner2
    movlw 0bfh
    movwf counter_l
Dloop5
    nop
    nop
    nop
    decfsz counter_l,f
    goto   Dloop5
    decfsz counter_h,f
    goto   Inner2
    nop
    return

```

```

sdelay
    movlw 057h
    movwf counter_h
Inner3
    movlw 0bfh
    movwf counter_l
Dloop6
    nop
    nop

```

```
nop
decfsz counter_l,f
goto Dloop6
decfsz counter_h,f
goto Inner3
nop
return
end
```